



The forecast behavioural and energy impacts of a European take-up strategy for CHUMS [D4.3]

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1 Introduction

1.1 Objectives of this report

This deliverable describes the behavioural and energy impacts of a European take-up of the CHUMS measures.

In first instance, a long-term take-up towards 2020 is considered. Additionally, the potential of the take-up of the CHUMS measures all over Europe is described.

1.2 The CHUMS project

The CHUMS project addresses the energy challenge of low car occupancy and the ≈50% of journeys in cities that cannot be accommodated by conventional public transport modes. The enormous potential of carpooling strategies has been frustrated by the traditional behavioural, social and cultural barriers people have to sharing cars – this is the challenge of ‘CHUMS’. The **aim of the project** is to apply a composite CHUMS behavioural change strategy, developed by the consortium and to transfer the proven methods to the rest of Europe, through validating the method in 5 ‘champion’ cities that represent the scale of carpooling and the diversity of mobility mind-sets across Europe: Craiova (RO), Edinburgh (UK), Leuven (B), Toulouse (F) and Perugia (IT).

The CHUMS behaviour change strategy includes a carpooling week, conducting personalised travel plans, which include carpooling options and providing a mobility jackpot lottery to attract people to carpool. These have all been shown to produce significant behavioural changes in a wide range of places where they have been delivered: increasing car occupancy, reducing car numbers and significantly reducing energy use. The CHUMS project has been tested in over 1000 carpooling sites in the UK and has achieved significant success.



Liftshare Founder, Ali Clabburn receives the Queen's award for achievement

The **strategic aim** of CHUMS is simple – to ‘attract car-poolers, match them and retain them’, to keep the numbers rising, and to develop and transfer this proven practice to generate a core sustainable market for carpooling across Europe, so that it becomes a habitual way to travel and a recognised mobility mode for transport planning. All of the 5 ‘champion cities’ have existing car-pooling systems, at various stages of maturity, which serve ‘closed’ target groups such as work-places, large employers or universities. Once proven, the application will be equally valid for ‘open’ systems for citizens in general. The project has already developed a European carpooling ‘interest group’ with members from 19 member states and candidate countries; where further take-up of the CHUMS measures will be developed during the project. The 10 fully committed CHUMS partners include mobility behaviour experts, city authorities and carpool operators.

1.3 CHUMS terms and definitions

In order to achieve a strong common understanding of the CHUMS activities and more specifically the evaluation, we define following key words as they are used in the CHUMS project:

- **Carpooling** is when two or more people, usually who are headed to the same destination, travel together by car for all or part of a journey. Driver and passenger(s) know before leaving that they will share at least part of the trip, with this arrangement made using a coordinating body. Usually, a mutual agreement is reached between carpooling participants to share expenses or take turns to drive in order to reduce personal costs or time loss. Both the driver and passenger(s) are called “car-poolers”. Importantly, professional and/or commercial vehicles are excluded. In this way, carpooling is in fact formal carpooling, as the opposite of informal carpooling.
- **Informal Carpooling:** trips which are shared between members of the same family or close friends and neighbours who give each other a lift. No technology is used to arrange the shared trips (except perhaps a phone call to a friend). In that case we just have a driver with passengers.
- **Car sharing** is where individuals hire cars on an hourly, daily or weekly basis allowing flexible access to a vehicle when required. This short-term access allows multiple individuals to access the benefits of car ownership but can reduce the cost significantly – often called “car clubs”.
- **Carpooling system:** an “attract-match-retain” scheme for carpooling which can be used to check the carpooling possibilities and to make the required arrangements
- **Coordinating bodies:** Liftshare.com (UK), RAT (Craiova), Taxistop (BE) and FI-start (Perugia). These organisations operate services that allow prospective car-poolers to find suitable matches and provide the initial information needed to contact a potential car-pooler.
- **Carpool manager/carpool coordinator** employed at the individual sites and set-up “attract-match-retain” schemes for carpooling. They are the primary interface with the carpoolers. This role is different to that of the champion, as coordinators are responsible for the day-to-day management of a carpool scheme. Where possible, carpool coordinators should communicate with all employees in order to promote the scheme and to receive feedback.
- **Site:** CHUMS has 5 sites in which the carpooling schemes are active; a site can have more companies (employers) which can have different seats on different locations
- **Target group of a carpool scheme:** (potential) user of a specific carpool system e.g. persons working in the same company (employer) or in the same seat of a company or in an area in which we have more companies. They are approach as a whole group by the CHUMS measures. Eventually we can identify sub-groups.

1.4 The CHUMS objectives

The **main objective of CHUMS** is to **change travel behaviour mind-sets from single occupancy driving** towards sharing the journey to work and decreasing the 50% of commuters who currently drive alone. The target is to demonstrate that a combined package of measures, which promotes and supports carpooling, can achieve a 12% reduction in energy use for the journey to work at targeted employment sites.

In this perspective the **specific objectives** for the CHUMS project are:

- To promote and support more sustainable and energy efficient travel behaviour through the CHUMS behaviour change package of measures
- To attract-match-retain more employees to use carpooling for their commute to work trips resulting in an increase in carpooling mode share of 11%.
- To minimise barriers to use in order to enable widespread uptake.
- To encourage employers and local authorities to champion the CHUMS approach, hence increasing the project's coverage and ensuring the project's on-going success.
- To implement CHUMS within 5 cities in 5 countries targeting a minimum of 47,000 employees
- Decreasing the use of the car to targeted employment sites during rush hour by 9% and decreasing single occupancy car trips by 22%.
- Realising a direct saving of 2,341,000 litres/annum of fuel which is equivalent to 1992 toe/annum in energy savings
- Realising an indirect saving of 5788 tonnes CO2 equivalent per year

The **strategic objectives** on longer term - towards 2020 - are:

- Shift in behaviour for 22% of single occupancy drivers towards sharing their journey with a colleague at workplaces where CHUMS is introduced.
- To support the EU's 2020 target for energy and climate change achieving a >12% reduction in energy use for the journey to work sites.
- CHUMS adopted at employment sites across partner and follower countries. In total 150,000 employees across 10 countries are exposed to the CHUMS package of measures.
- Realising a direct saving of 23.54 million litres of fuel, equivalent to 20,035 toe in energy savings
- Realising in indirect saving of 58,206 tonnes CO2 equivalent

1.5 Objectives of the CHUMS evaluation

The primary objectives for the CHUMS evaluation are

- To identify the optimal conditions for implementing and continuing the CHUMS carpooling measures (carpool week, mobility jackpot, personalised travel planning) within the five diverse European demonstration sites, in order to support and facilitate the transfer of these measures to other cities and regions (i.e. within the CHUMS network)
- To provide a clear quantification of the effect of the CHUMS measures to change mobility behaviour and increase the take-up of carpooling among the target groups, allowing for an estimation of the impact on mobility by the year 2020.

On a second level, it is the objective to evaluate the implementation of the CHUMS wide spread take-up strategies. In this also the impact of these take-up strategies and the supporting dissemination activities need to be evaluated.

1.6 Main outputs the Evaluation Work package

1.6.1 Deliverable(s)

The 3 main deliverables of the CHUMS evaluation work are:

- **D4.1: The CHUMS evaluation plan:** integration of current best practices on mobility behaviour and sustainability evaluation (from Task 4.1)

- **D4.2: The impacts of the CHUMS measures** in 5 European sites and associated transferability potentials (from Task 4.3 and 4.3)
- **D4.3 (this deliverable): The forecast behavioural and energy impacts of a European take-up strategy for CHUMS** – breaking down the barriers to carpooling (from Tasks 4.3 and 4.4 with input from WP5)

Additionally there will a working document:

- **W4.1: The baseline situation** before the implementation of the CHUMS measures – Month 10

1.6.2 Other outputs

Beside the deliverables and working document, WP 4 will produce the following outputs:

- a detailed methodology for analysis of measures to support carpooling
- an operational web-based questionnaire for (potential) users of carpool schemes
- a database of raw data on the behaviour and attitude of target groups of carpooling schemes in 5 EU sites.
- a comparison of automated versus conventional user approaches
- a quantitative support to the transfer activities showing the importance of measures and specific elements in the approaches.

In this way the Work Package ‘Evaluation’ will contribute on different levels to the envisaged result of the project.

1.7 Structure of this report

Chapter 2 describes the take-up strategy, with an explanation on how the CHUMS measures can be transferred towards other target groups, cities and countries, and with a description of the two take-up scenarios that are assessed.

Chapter 3 and chapter 4 describe the take-up methodology and results for the two scenarios.

The conclusions can be found in chapter 5.

2 Take-up strategy

2.1 Take-up of the CHUMS measures

The strategic aim of the CHUMS project is not only to implement the three CHUMS measures in the 5 sites who are participating in the project, but also keep the numbers rising, and develop and transfer them to generate a core sustainable market for carpooling across Europe.

During the CHUMS project several deliverables are generated that can be used as a guideline for any prospective city/regional authority or private company who wants to implement a new carpool system or improve the use of an existing one. A short overview:

- **D2.2 Common European approach to implementing the CHUMS Measures (Final approach):**
 - This is a Concise step by step guide of how to deliver:
 - **Site appraisal** – Tool to identify suitable workplace for CHUMS measures
 - **Carpool week** – How to plan and design, popular branding and promotion techniques and estimated costs
 - **Mobility Jackpot** – Popular prizes, frequency, how to run a prize draw, promotion
 - **Personalised Travel Plans** – training of interviewers, tips on reducing costs, manual vs automated, evaluation
 - It draws from experience of all 5 CHUMS city demonstrations
- **D3.1 Implementation of CHUMS in 5 European cities:**
 - It tells the specific stories from each of the 5 cities:
 - Insight on what worked well and not so well
 - Success factors and recommendations
 - How businesses and staff engaged
 - Ideas of cost effective promotion materials
 - How challenges were overcome
 - e.g. how to integrate carpool promotion with other sustainable modes
 - Which incentives work
- **D3.2 Guide for introducing automated PTPs:**
 - Possible to offer cost effective personalised travel plans - with carpooling options - to staff drawing on open transport data like Google Transit

- Liftshare’s myPTP has proven successful in many sites with post code to post code journey plans
- Staff invited to join via single emails
- Much cheaper than face to face PTPs
- Guide presents case studies and tips
- **D5.1 Financial and Social Barriers to accepting CHUMS Measures**
 - **Financials** – Estimate cost of your CHUMS measure useful tool
 - Cost of delivering individual CHUMS measures, based on our demos
 - Economies of scale best for sites of > 2000 employees
 - Costs in Year 2 approx. 30% to 60% less than Year 1
 - **Social – Different barriers / motivations for change - factors to bear in mind**
 - Sharing concept most popular with under 25 year-olds
 - Popular Incentives: Financial in UK and Romania; Experiential in France and Belgium
 - Personal safety: Carpooling with same sex improves chances of female car pooling
 - Encouragement from peers, validation, very effective in France
 - “what made you carpool..”
 - Make CHUMS most effective by knowing your audience’s trigger points

Because other cities/companies can learn from the project, target groups can be chosen more wisely, challenges can be overcome more easily, and the implementation can be carried out more cost effective. Therefore, the chance for success will be higher than for the 5 CHUMS sites at the beginning of the project.

In this deliverable, we assess the effects of take-up of the CHUMS measures across Europe, taking into account the aid of the lessons learned and best practices developed during the project.

2.2 Description of take-up scenarios

Two take-up scenarios are considered: a long-term scenario towards 2020 and a further European take-up that consists of a widespread approach towards all European cities.

2.2.1 Take-up scenario towards 2020

The first scenario is the take-up beyond the duration of the project until 2020. From the end of the project to 2020 there are almost four years in which the CHUMS approach will be transferred towards new target groups, new cities and new countries across Europe.

This take-up will be carried out on three levels:

1. **Local level:** take-up in the 5 CHUMS sites (Edinburgh, Toulouse, Perugia, Craiova, Leuven), which consists of:
 - a. Targeting **the same target groups** as in the CHUMS project, with the aim of reaching and attracting more persons, retain the active ones and (re)activating non-carpooling members
 - b. Adding **extra target groups** in the city/region
2. **National level:** expansion towards other cities/regions in the 5 countries (UK, France, Italy, Romania, Belgium)
3. **European level:** follower cities in the CHUMS network who are already planning to implement the CHUMS measures

2.2.2 Further European take-up

In addition to the realistic 2020 scenario, a more idealistic scenario is considered: what if the CHUMS measures were carried out in every European city, at every company and every university? And, what if an iterative approach is used for this, that the CHUMS measures are carried out every year, attracting and matching new carpool users and retaining the existing ones?

This scenario actually expresses the total potential impact of the CHUMS approach in Europe.

3 Take-up scenario towards 2020

3.1 Calculation methodology

The impact of the implementation of CHUMS measures varies across the different target groups in the 5 champion cities. The level of success depends on different elements, such as:

- The travel profile of the target group
- The size of the target group
- The presence/absence of a critical mass
- The involvement of the company itself
- The presence/absence of incentives like carpool parking/tax benefits
- The shortage/excess of parking places at the site

Because the lessons learned, future implementation of the CHUMS measures can take into account many of these elements in order to increase the chance of success significantly. The target group can be chosen well, a lot of focus can be put on the commitment of the company, incentives can be changed.

However, realistically not every barrier can be eliminated in each occasion. Also, the existence of a critical mass is only created after repetition of promotion campaigns such as the CHUMS measures. So, the impact of the CHUMS will depend on the situation.

For the calculation of the impact of take-up, we will consider three possible impact levels:

- A **low level** for target groups that did not have a critical mass for carpooling before the CHUMS measures are implemented
- A **high level** for target groups that already have a strong critical mass established at their site and/or there are exceptional positive circumstances for carpooling at the site
- A **intermediate level** for the cases that are in between the low and high level, because the critical mass is not established but other contextual elements contribute to a more positive impact OR there is already a critical mass established but other contextual elements contribute to a more negative impact. This is actually the level we can expect from the CHUMS measures for most of the target groups.

For calculating the environmental impacts, factors will be applied to the number of employees/students targeted. These factors are set for the three levels, based on the results from the CHUMS project:

- The low level impact is based on the impacts of the CHUMS measures at the sites of Edinburgh Park, Toulouse TOP, Perugia (municipality and university) and Leuven UCLL (students)
- The high level impact is based on the impacts of the CHUMS measures at the sites of Craiova ELPRECO, Craiova ICMET and Leuven Colruyt Group.
- The intermediate level is taken as the average of the low and high level values, and is similar to the impact of the CHUMS measures at the sites of Edinburgh University, Toulouse Héliopole and the target group at Toulouse for the second CHUMS phase.

The factors can be found in the table below:

	km savings	fuel savings	energy savings *	CO2 emission savings*
low	0.76	0.06	0.05	0.15
high	27.14	1.94	1.63	4.86
average	13.95	1.00	0.84	2.51

Table 3-1 Environmental impact factors applied per targeted person for the three impact levels
*: this factor needs to be multiplied by 10^{-3}

3.2 Assumptions about target groups and impact levels

Level 1 - local level

Level 1a

The same target groups as in the CHUMS project are targeted further towards 2020. We assume that the CHUMS measures can be carried out an extra 3 times until 2020.

Concerning the impact levels, we assume:

- Edinburgh: average impact level for both the university and Edinburgh Park
- Toulouse: average impact level for the whole target group
- Perugia: in the first two years the level will be low, but in the third year the impact will be average
- Craiova: average impact level for every target group, because there already is a high level from the first CHUMS campaign
- Leuven: average impact level

Level 1b

Extra target groups are added in the city or region. We assume that every city will reach an extra of 10,000 persons, and Craiova will reach at least 20,000 extra because they have already enlarged the actual target group.

We assume by 2020 it is realistic to carry out the CHUMS measures 2 times.

Concerning the impact levels, we assume:

- Edinburgh: average impact level
- Toulouse: average impact level
- Perugia: 1/2 low impact level, 1/2 average: because carpooling is a new mode in Perugia, we expect the first campaign to have low impact
- Craiova: 1/ 2 average impact level, 1/2 high impact level: we expect to have similar results as the existing target groups in Craiova
- Leuven: average impact level

Level 2 - national level

The CHUMS measures are expanded towards other cities/regions in the 5 countries (UK, France, Italy, Romania, Belgium). We assume that the measures will be implemented at 2 new cities, and that 7,500 persons will be targeted in every city.

We assume by 2020 it is realistic to carry out the CHUMS measures 1 time.

Concerning the impact levels, we assume:

- UK: average impact level
- France: average impact level
- Italy: 1/2 low impact level, 1/2 average: because carpooling is a new mode in Italy, we expect the first campaign to have low impact
- Romania: 1/ 2 average impact level, 1/2 high impact level: we expect to have similar results as the target groups in Craiova
- Belgium: average impact level

Level 3 - European level

Five of the 12 follower cities in the CHUMS network will implement the CHUMS measures. This goal is realistic, because three of the follower cities have already started to use the CHUMS knowhow in their work. We assume that they will each target around 7,500 persons.

We assume by 2020 it is realistic to carry out the CHUMS measures 2 times.

We additionally assume that each of CHUMS campaigns in the follower cities will have an average impact level.

3.3 Resulting impacts

Using the calculation methodology as described above and taking into account the assumptions about target groups and impact levels, the expected impacts towards 2020 are calculated for each take-up level. The next tables show the results for each level:

scenario 1A local level: target group of CHUMS project					
	number of employees/ students	annual km savings car drivers	annual fuel savings (litres)	annual energy savings (toe)	annual CO2 emission savings (tonnes)
Edinburgh	16 125	674 777	48 281	41	121
Toulouse	21 494	899 452	64 357	54	162
Perugia	2 152	33 281	2 398	2	6
Craiova	10 850	454 036	32 487	27	82
Leuven	11 365	475 587	34 029	29	85
TOTAL	61 986	2 537 134	181 552	153	456

Table 3-2 Environmental impact of take-up level 1a (CHUMS target groups)

scenario 1B local level: extra target groups in the CHUMS cities					
	number of employees/ students	annual km savings car drivers	annual fuel savings (litres)	annual energy savings (toe)	annual CO2 emission savings (tonnes)
Edinburgh	10 000	278 978	19 961	17	50
Toulouse	10 000	278 978	19 961	17	50
Perugia	10 000	147 071	10 561	9	27
Craiova	20 000	821 768	58 724	49	147
Leuven	10 000	278 978	19 961	17	50
TOTAL	60 000	1 805 773	129 168	109	324

Table 3-3 Environmental impact of take-up level 1b (extra target groups in the CHUMS cities)

scenario 2 national level: expansion towards other cities in the CHUMS countries					
	number of employees/ students	annual km savings car drivers	annual fuel savings (litres)	annual energy savings (toe)	annual CO2 emission savings (tonnes)
UK	15 000	209 233	14 971	13	38
France	15 000	209 233	14 971	13	38
Italy	15 000	110 303	7 921	7	20
Romania	15 000	308 163	22 021	19	55
Belgium	15 000	209 233	14 971	13	38
TOTAL	75 000	1 046 166	74 855	63	188

Table 3-4 Environmental impact of take-up level 2 (extra target groups in other cities in the CHUMS countries)

scenario 3 European level: follower cities					
	number of employees/ students	annual km savings car drivers	annual fuel savings (litres)	annual energy savings (toe)	annual CO2 emission savings (tonnes)
follower city 1	7 500	209 233	14 971	13	38
follower city 2	7 500	209 233	14 971	13	38
follower city 3	7 500	209 233	14 971	13	38
follower city 4	7 500	209 233	14 971	13	38
follower city 5	7 500	209 233	14 971	13	38
TOTAL	37 500	1 046 166	74 855	63	188

Table 3-5 Environmental impact of take-up level 3 (extra target groups in the CHUMS follower cities)

Taking these results in account together with the impact of the CHUMS project (2014-2016), we conclude that towards 2020 the CHUMS approach will be influence 234,486 employees and students in 10 different European countries. A direct saving of 494,297 litres of fuel, equivalent to 416 toe is realised, together with an indirect saving of 1,235 tonnes of CO₂ equivalent. An overview of the results can be found in the table below:

total take-up towards 2020					
	number of employees/ students	annual km savings car drivers	annual fuel savings (litres)	annual energy savings (toe)	annual CO2 emission savings (tonnes)
CHUMS project	61 986	461 350	33 867	28	79
scenario 1A		2 537 134	181 552	153	456
scenario 1B	60 000	1 805 773	129 168	109	324
scenario 2	75 000	1 046 166	74 855	63	188
scenario 3	37 500	1 046 166	74 855	63	188
TOTAL	234 486	6 896 590	494 297	416	1 235

Table 3-6 Total environmental impact of take-up towards 2020

The energy use for the commute trips will be reduced in 2020 by 0.72% for all take-up target groups. For the CHUMS project target groups the reduction will be highest with 1.18%, because the employees were exposed more times to the CHUMS measures

There will be a behaviour shift for 0.74% of single occupancy drivers towards sharing their journey with a colleague at the target groups towards 2020.

4 Further European take-up

4.1 Target groups

The target group for the European take-up are the employees of companies situated in European cities and students at European universities and other higher education institutions.

Employees

We consider cities with an urban centre of 50,000 inhabitants or more. In Europe, there are about 190,400,000 inhabitants living in such a city (see Table 4-1). Based on the employee/inhabitant ratio in Brussels¹, we estimate the total number of employees working in European cities on almost 109,000,000.

Degree of urbanisation	Population		N° of cities*
	absolute	%	
<i>Rural areas</i>	154 125 040	28.3	
<i>Towns and suburbs**</i>	155,900,491	31.2	
Cities*	203,078,408	40.6	811
<i>Urban centre size</i>			
50 000 – 100 000	38,067,398	7.6	412
100 000 – 250 000	47,494,019	9.5	263
250 000 – 500 000	25,336,401	5.1	71
500 000 – 1 000 000	29,104,398	5.8	39
> 1 000 000	63,076,191	12.6	26
<i>Total EU-28</i>	<i>500,432,969</i>	<i>100</i>	

Table 4-1 Number of inhabitants in the different types of regions in Europe. sSource: European Commission (JRC, EFGS, DG REGIO)

Students

Based on the Eurostat data of 2014 there are about 32,900,000 students at universities and other higher education institutes around Europe.

4.2 Calculation methodology and assumptions

The impact an iterative approach of the CHUMS measures in all the European cities is calculated by assuming that all solo car drivers that have a positive attitude towards carpooling will be convinced to carpool. Following assumptions are made during this calculation:

- Based on the EPOMM modal split tool² we estimate that 50% of all employees are solo car drivers. Based on the figures of the University of Edinburgh, we assume that 10% of all students are solo car drivers.

¹ van Lier, T., De Witte, A., Macharis, C. (2012). The impact of telework on transport externalities: the case of Brussels Capital Region (pp. 241)

² <http://epomm.eu/tems/>

- Comparing different cases, both within the CHUMS project and beyond, we can assume that for both employees and students, 50% of them have a positive attitude towards carpooling.
- We assume an average distance of 15 km between home and work/school (in one direction) for both employees and students.
- Employees will travel to work around 220 days per year, students will commute around 150 days per year.

4.3 Resulting impact

An iterative approach of the CHUMS measures in all the European cities will result in a direct saving of more than 3.4 billion litres of fuel per year, equivalent to almost 2.9 million toe. This results in an indirect saving of almost 8 million tonnes of CO₂ equivalent. An overview of the results can be found in the table below:

further European take-up					
	number of employees/students	annual km savings car drivers	annual fuel savings (litres)	annual energy savings (toe)	annual CO2 emission savings (tonnes)
employees	108 997 515	44 961 474 850	3 300 515 579	2 770 598	7 677 572
students	32 863 298	1 848 560 513	135 698 457	113 911	315 658
TOTAL	141 860 813	46 810 035 362	3 436 214 037	2 884 509	7 993 230

Table 4-2 Total environmental impact of a further European take-up

5 Conclusions

Two take-up scenarios are considered: a long-term scenario towards 2020 and a further European take-up that consists of a widespread approach towards all European cities.

The first scenario is the **take-up beyond the duration of the project until 2020**. The CHUMS approach will be transferred towards new target groups, new cities and new countries across Europe.

Around 234,500 employees and students in 10 different European countries will be targeted, which will result in a direct saving of 494,297 litres of fuel, equivalent to 416 toe, together with an indirect saving of 1,235 tonnes of CO₂ equivalent.

In addition a more idealistic scenario is considered, which actually expresses the **total potential impact of the CHUMS approach in Europe**. It targets the employees of companies situated in European cities of more than 50,000 inhabitants and all students at European universities and other higher education institutions.

This full take-up of the CHUMS approach will result in a direct saving of more than 3.4 billion litres of fuel per year, equivalent to almost 2.9 million toe, together with an indirect saving of almost 8 million tonnes of CO₂ equivalent.